

Ranked List of Effectiveness Study Topics and Potential Questions

| RANK | Stormwater Management Program Element | Effectiveness Study Topic Null Hypothesis (H₀) | Potential Questions for Request for Proposals |
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| 1 | Source Control | Construction site inspections are not effective at controlling sediments and turbidity from permitted construction sites. | <ul style="list-style-type: none"> • Are the temporary erosion and sediment control Best Management Practices (BMPs) required during development or redevelopment adequate to control erosion and sediment from construction sites? • Are the temporary erosion and sediment control BMPs used at construction sites effective at reducing turbidity/TSS for compliance with water quality standards? • What frequency of construction erosion and sediment control inspections are most effective for achieving compliance with codes/ordinance requirements at new development and redevelopment project sites? |
| 2 | Source Control | Education and inspection of private stormwater facilities does not affect water quality. | <ul style="list-style-type: none"> • Do more frequent site visits and contact with private facility owners improve compliance with operation and maintenance (O&M) requirements? • What is the optimum frequency of inspections to maintain the functionality of private stormwater facilities? |
| 3 | Public Education | Permit-required public education programs do not result in decreased levels of pollutants in stormwater. | <ul style="list-style-type: none"> • Are fecal coliform levels in stormwater reduced after an extensive pet waste education program? • Are nutrient levels in stormwater reduced following an extensive natural yard care education program? • Are pesticide concentrations and number of hits reduced in an urban stream following general awareness? • Does establishing a spill hotline result in reduced stormwater pollutants? • Does a fundraiser car washing education program result in reduced surfactants in stormwater? |
| 4 | Illicit Discharge Detection and Elimination (IDDE) | IDDE program components are not effective at reducing pollutants. | <ul style="list-style-type: none"> • Which combination of methods; smoke testing, dye testing, CCTV, flow monitoring and outfall screening (wet and dry season) work best for detection of illicit connections? • How effective is wet weather screening as a tool to detect illicit connections? • Which parameters should be measured during dry weather screening to improve the ability to detect illicit connections? |

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| 5 | O&M-Pollution Prevention | Frequency of inspecting and cleaning catch basins is not dependent on land use or road size. | <ul style="list-style-type: none"> • Do catch basins on arterial streets require more frequent cleaning vs. non-arterial streets? • Can land use or road size/type be used to set an optimal frequency for inspection and cleaning catch basins? • Does the land use surrounding a catch basins influence the rate of sediment accumulation in catch basins? • Can catch basin maintenance frequency be determined by land use surrounding the catch basin? |
| 6 | Low Impact Development (LID) | LID measures are not effective at reducing storm flows in retrofits and new development. | <ul style="list-style-type: none"> • Which LID measures are most effective at reducing flow from developed areas? • Will installing porous pavement in alleys and road rights-of-way with rain gardens substantially reduce runoff? • Does amending landscapes with compost significantly reduce flows during small and medium storms? • Is LID more effective than traditional BMPs for improving hydrology at the basin scale? • Will a developed basin with a high density of LID measures have measurable differences in hydrology and pollutant loads compared to a similar basin with a low density of LID measures? • How well can a calibrated and verified stormwater model (<i>e.g.</i>, SUSTAIN and EPA SWMM5) function as a replacement for a control in a paired watershed study design? |
| 7 | LID | LID measures are not effective at reducing pollutant loads in retrofits and new development. | <ul style="list-style-type: none"> • Does the installation of bioretention, bioinfiltration, biofiltration, rain gardens, and other LID measures have a measurable effect on water quality? • Which LID measures are most effective at improving water quality from developed areas? • Can compost mixes and plant species be tailored to enhance removal of specific pollutants (<i>i.e.</i>, phosphorus, metals, bacteria)? • Is LID more effective than traditional BMPs for improving water quality at the basin scale? • Will a developed basin with a high density of LID measures have measurable differences in pollutant loads compared to a similar basin with a low density of LID measures? • Does bioretention treat runoff sufficiently to allow for infiltration without violating groundwater quality standards? • What type and frequency of maintenance is needed to ensure the long-term performance of bioretention facilities? |

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| 8 | Source Control | Business inspection and outreach are not effective source control techniques. | <ul style="list-style-type: none"> • Are businesses that receive an in-person visit/inspection more likely to implement source control BMPs? • What frequency of business inspections is most effective for implementing and maintaining source control requirements/BMPs at businesses? |
| 9 | Public Education | Permit-required public education programs promoting behavior change do not result in increased awareness and behavior change. | <ul style="list-style-type: none"> • What is the increase or decrease over time of various target audiences willing to make a simple change in their daily lives to help Puget Sound? • What is the increase or decrease over time of various target audiences willing to invest over \$1,000 to make a change in their property to help Puget Sound? • What is the increase or decrease over time of car owners to fix leaks? • What is the increase or decrease in stormwater drain awareness of various business sectors involved in commercial property maintenance inspections? • Does a fundraiser car wash education program decrease the number of fundraiser car wash events? |
| 10 | Traditional BMPs | Retrofitting using water quality treatment devices does not reduce pollutant loads. | <ul style="list-style-type: none"> • Which combinations of retrofit BMPs in a basin are most effective at reducing pollutants to receiving waters? • To what extent does retrofitting using water quality treatment devices reduce urban stormwater pollution to receiving water bodies? • Once installed, do model predicted quantities of stormwater controls in a basin reduce stormwater impacts enough to support the receiving water's designated beneficial uses? |
| 11 | LID | LID measures are not feasible in areas with tight soils or shallow groundwater. | <ul style="list-style-type: none"> • What, if any, LID measures are feasible in areas with tight soils? • What, if any, LID measures feasible in areas with shallow groundwater? |
| 12 | Traditional BMPs | Reducing the size of a filter strip does not alter its effectiveness at reducing pollutant concentrations. | <ul style="list-style-type: none"> • Are existing sizing criteria for vegetative filter strips (based on bioswales) overly conservative? • Which combinations of length, width, slope, soil types and vegetation types result in greatest removal of sediment by vegetative filter strips? |
| 13 | LID | Permeable pavement will fail on high-speed roads. | <ul style="list-style-type: none"> • Is permeable pavement feasible over the long-term for applications on high-speed roads? |
| 14 | LID | Recycled concrete cannot be used to provide storage under permeable pavement. | <ul style="list-style-type: none"> • Can recycled concrete be used as storage under permeable pavement? |

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| 15 | O&M-Pollution Prevention | Catch basins do not contribute sufficient fecal coliform bacteria to exceed water quality standards. | <ul style="list-style-type: none"> • Are catch basins a significant source of fecal coliform or other pollutants? • What frequency of catch basin maintenance is needed to reduce the level of fecal coliform to meet Total Maximum Daily Load (TMDL) requirements? |
| 16 | Public Education | Public Education of lake property owners about residential pollutants will not reduce summer algae blooms. | <ul style="list-style-type: none"> • Are summer algae blooms due to excess runoff or recycling of nutrients? • Can education and prevention of phosphorus loads from runoff influence the frequency and duration of lake algae blooms? |
| 17 | Public Education | Storm drain stenciling does not raise awareness about where stormwater goes or that it is not treated. | <ul style="list-style-type: none"> • What is the level of awareness of adjacent land owners to storm drain stencils compared to landowners with no storm drain stencils? |
| 18 | Traditional BMPs | There are no differences in ecological or intrinsic human benefits derived from maintained versus unmaintained stormwater ponds. | <ul style="list-style-type: none"> • Are water quality benefits increased by letting ponds take a more natural, successional path rather than continual maintenance? • Do humans value the unmaintained pond for the “wildness” it can introduce to their neighborhood (trees, shrubs, wildlife, etc.) |
| 19 | Source Control | Nutrient and Integrated Pest Management (IPM) programs do not improve water quality in receiving water bodies. | <ul style="list-style-type: none"> • Does implementation of nutrient management result in the reduction of nutrients in stormwater? • Does implementation of IPM result in the reduction of pesticides in stormwater? |
| 20 | Traditional BMPs | Toxics are not transferred to the nearshore from uplands by stormwater infrastructure. | <ul style="list-style-type: none"> • Will installation of devices to restrict tidal influence on stormwater systems reduce the transfer of toxics to Puget Sound? |
| 21 | Traditional BMPs | Oil/water separators are not effective in driveway applications. | <ul style="list-style-type: none"> • What is the lowest threshold of paved surface that makes it cost/treatment effective to install an oil/water separator? • Are there other methods (<i>i.e.</i>, LID) that would be as effective in improving water quality as oil/water separators? |
| 22 | IDDE | Receiving water body sampling does not confirm removal of an illicit connection or successful IDDE program. | <ul style="list-style-type: none"> • How well does receiving water body sampling confirm the elimination of illicit connections? • Are there measurable differences in the concentration of fecal coliform in a receiving water body when illicit connections are removed? |